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AGDISP MOD 5.0 Workshop USDA Forest Service

Missoula Technology & Development Center

Forest Pest Management



Management Question

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How Well Does Model Represent Real World? Management

How Well Does Model Represent Real World?

Two Points

- 1. AGDISP is widely available, user friendly and economical to run on a PC XT or Data General minicomputer
- 2. AGDISP adequately represents the real world for representation of most "near aircraft" aerial application predictions.

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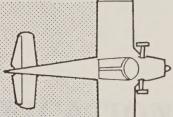
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A PROBLEM ANALYSIS

Forest and Range Aerial Pesticide Application Technology



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		Expected Con	tribution to	
Problem Area	Priority 1/	Drift Reduction	Cost Reduction	Increased Efficacy
Mircraft Delivery Systems	9	High	High	High
Aircraft Guidance	7	High	Low	High
Application Strategy	6	Medium	Low	High
Biological Interface	4	Low	Low	High
Meteorology	6	High	Low	Medium
Pesticide Safety	3	Low	Low	Low
Spray Behavior	8	High	Medium	High
Spray Drift	5	High	Low	Low
Sampling	3	Low	Low	Low
Technology Transfer ? N	OW 9	High	High	High

1/ Priority on scale from 1 to 10; 10 highest, 1 lowest.



U.S. Department of Agriculture
Forest Service

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MODEL CLASSIFICATIONS

BOTTOWED From FIRE RESEARCH

Mental Models
Statistical Models
Gaming Models
Empirical Models
Simulation Models
Mathematical Programming Models
Mechanistic Models

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Medical Models

Statistical Professoration (Models

AGDISP and FSCBG Models

Selecting: & Comparing

Aircraft and Spray Systems

Nozzle Position on Spray Booms

Flight Altitudes

Swath Widths

Tank Mixes

Application Rates

Drop-Size Spectrum

Atmospheric Conditions

Application Timing

Effect of Evaporation

Developing Spray Prescription for

Specific Treatment Sites

Preparing Environmental Analyses

Post-Spray Evaluations

AGDISP

AGDISP

AGDISP,FSCBG

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Weather Theory

"Every theory of the course of events in nature is necessarily based on some process of simplification of the phenomena and is to some extent therefore a fairy tale."

Sir Napier Shaw, Manual of Meterology

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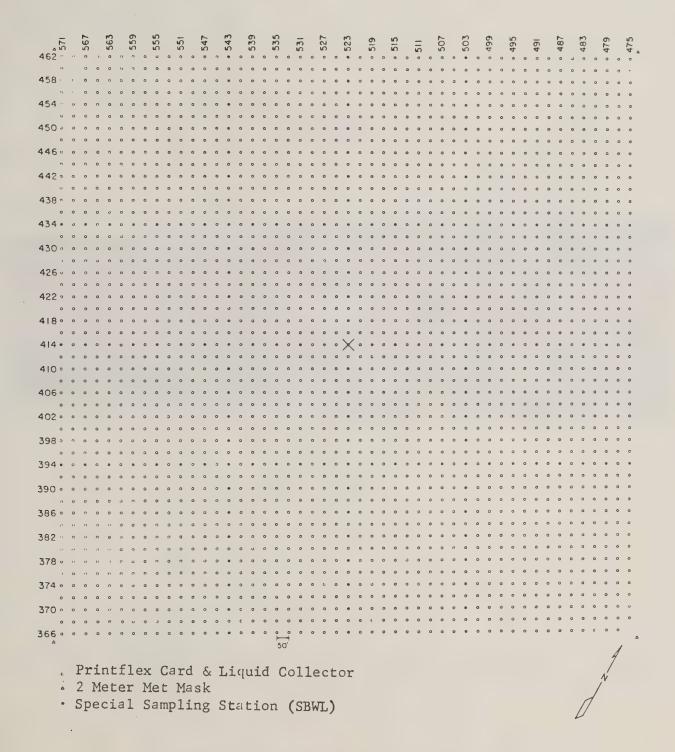


Figure 2-1. Grid Array for DPG Trials

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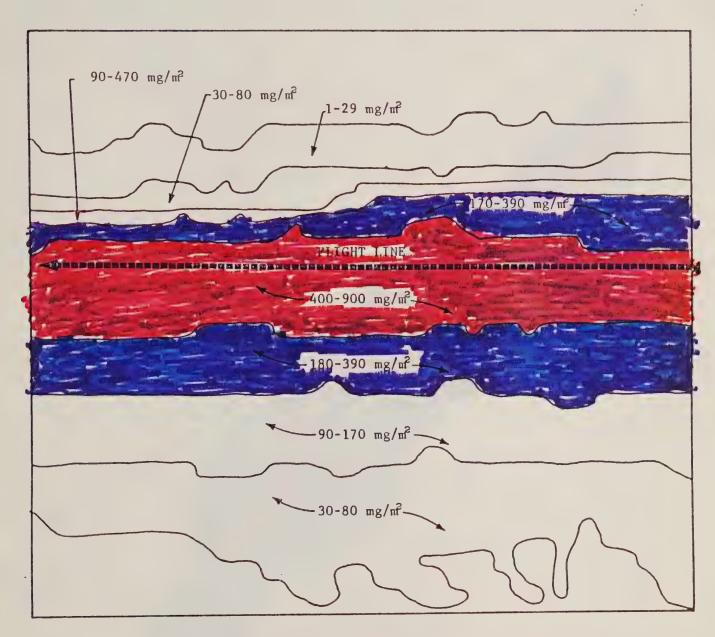
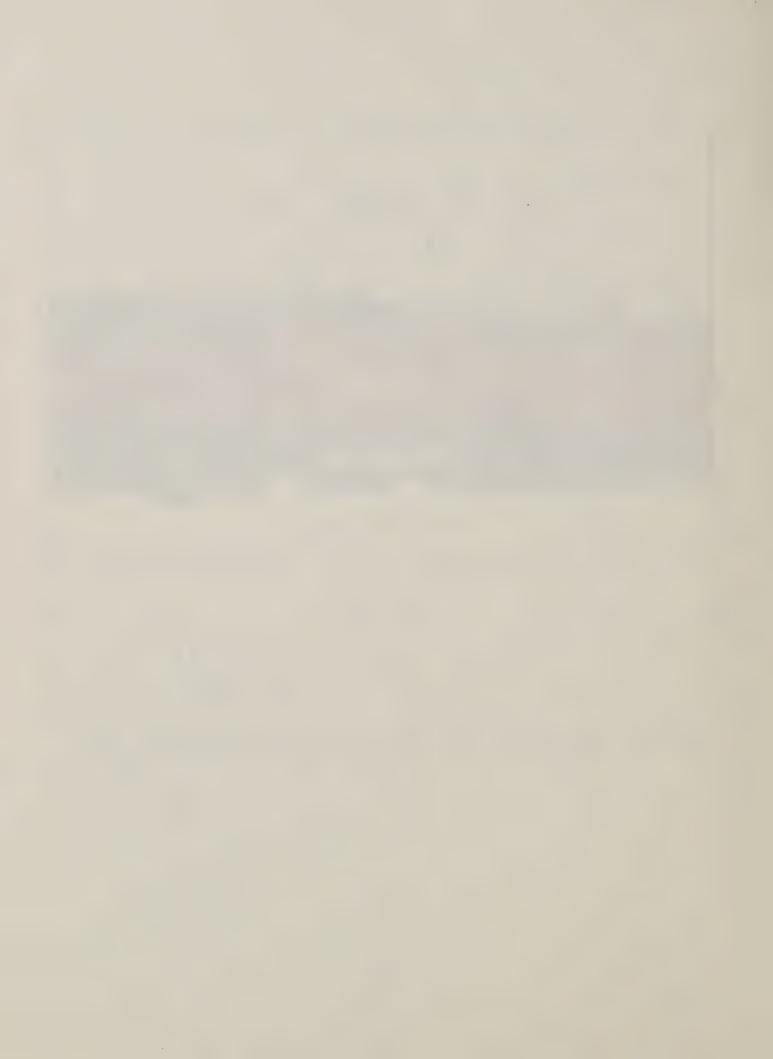
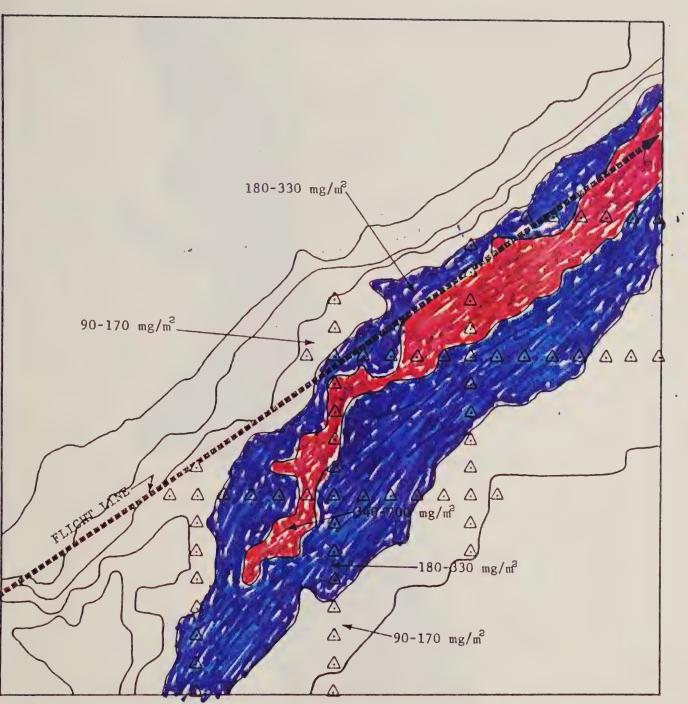


Figure 2-2. Contour Diagram Showing Area Covered by Selected Deposition Density Levels for the Zectran Mixture on Trial FS-1 (C-47/USFS Spray System)





 Δ = 100 percent Spruce Budworm Larvae Mortalities

Figure 2-3. Contour Diagram Showing Area Covered by Selected Deposition Density
Levels for the Zectran Mixture for Trial FS-2 (C-47/USFS Spray System)

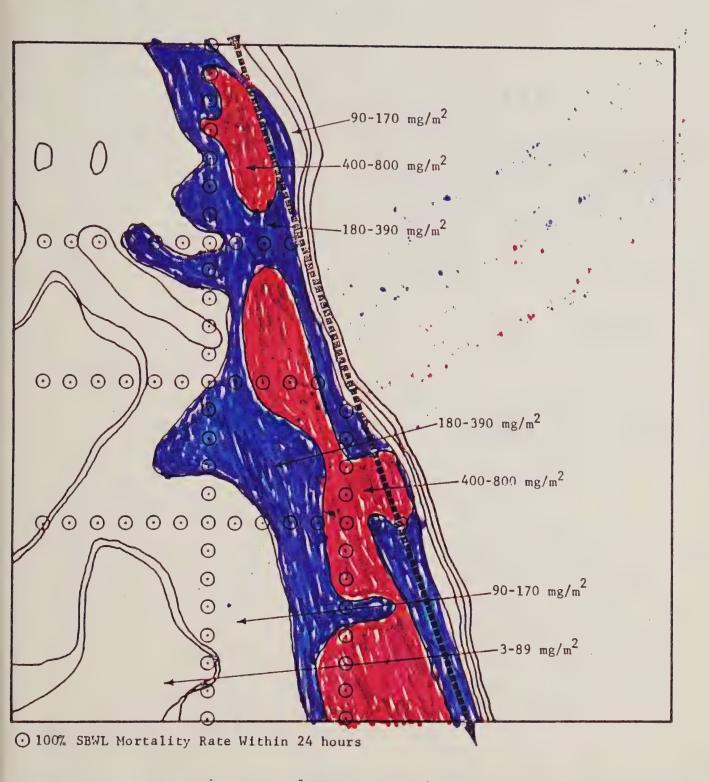


Figure 2-5. Contour Diagram Showing Area Covered by Selected Deposition Density Levels for the Zectran Mixture on Trial FS-4 (C-47/MISS)

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- O EXIT AGPLOT
- 1 MEAN PARTICLE TRAJECTORIES
- 2 MEAN + STANDARD DEVIATION TRAJECTORIES
- 3 VORTICES/HELICOPTER/ENGINE CENTROIDS
- 4 GROUND DEPOSITION -- CURRENT FILE
- 5 GROUND DEPOSITION -- MULTIPLE FILES
- 6 EQUIVALENT GAUSSIAN DISTRIBUTION
- 7 CROSSWIND VELOCITY PROFILE
- 8 PLANT AREA DENSITY PROFILE
- 9 DROPLET DIAMETER TIME HISTORY
- 10 DROPLET VERTICAL VELOCITY TIME HISTORY

OPTIONS AVAILABLE 1989

- 0 EXIT AGPLOT
- 1 MEAN DROPLET TRAJECTORIES
- 2 MEAN + STANDARD DEVIATION TRAJECTORIES
- 3 VORTICES/HELICOPTER/ENGINE CENTROIDS
- 4 GAUSSIAN GROUND DEPOSITION
- 5 CONTINUOUS GROUND DEPOSITION
- 6 CANOPY DEPOSITION
- 7 TOTAL CANOPY DEPOSITION
- 8 EQUIVALENT GAUSSIAN DISTRIBUTION
- 9 CROSSWIND VELOCITY PROFILE
- 10 CANOPY PLANT AREA FRACTION PROFILE
- 11 DROPLET DIAMETER TIME HISTORY
- 12 DROPLET CANOPY PARAMETER TIME HISTORY
- 13 DROPLET AXIAL VELOCITY TIME HISTORY
- 14 DROPLET HORIZONTAL VELOCITY TIME HISTORY
- 15 DROPLET VERTICAL VELOCITY TIME HISTORY
- 16 OBJECT DEPOSITION TIME HISTORY
- 17 DRIFT FRACTION TIME HISTORY
- Not all options will be "active" in any run -- AGDISP inputs control the content of the BIN plot files.

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MODIFICATION LEVEL

AGDISP code development has lead to the following versions of the code.

Mod. 2.0 Operational on a Control Data CYBER 175 at NASA-Langley.

Includes:

all of the basic program development: fully rolled-up vortices or Betz roll-up, simplified terrain modeling, WAKE plot file entry, models for propeller, helicopter, crosswind, superequilibrium turbulence, canopy, vortex penetration into canopy, and material evaporation. Also includes a stand-alone program (AGLINE) to construct the equivalent Gaussian distribution.

Graphics:

Tektronix 4025 and 401X terminals using NASA-Langley graphics software calls. Source Code Available from NASA

Mod. 3.0 Operational on a Univac 1108 at Ft. Collins (U.S. Forest Service).

Improvements: helicopter modeling with transition to rolled-up vortices; AGLINE calculations as a menu option in AGPLOT.

Additions: discrete crosswind velocity profile; nonzero deposition height; composite deposition plots (to 16 plot files); canopy penetration by helicopter downwash; plot option to plot material diameter time history.

Graphics: DISSPLA at Ft. Collins, with appropriate subroutine calls for Tektronix terminals.

Mod. 4.0 Operational on a VAX 11/785 at Dugway Proving Grounds (U.S. Army).

Improvements: Betz roll-up procedure and propeller model revised; equivalent Gaussian distribution selection criterion is a program decision involving material vertical velocity.

Additions: models for wide body effects, simple vortex circulation decay, jet engines, multiple powerplants and parameterized evaporation; default input file option; plot option to plot material vertical velocity time history.

Graphics: CALCOMP at Dugway, with appropriate subroutine calls for the pen plotter.

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Operational on a Cartre, Date (1925) It at MASA Langla

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Mod 5.0 Operational on a Data General MV-15000 at Missoula, and on IBM PC/XT/AT personal computers.

Improvements: Revised solution procedure eliminates integration

stepsize dependence on material decay time

constant.

Additions: Axial variation added to all models; ground

sprayer; continuous deposition; canopy

deposition; deposition on objects.

Graphics: GKS at Missoula; dot matrix printer output on IBM

PC/XT/AT.

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Add English Units

Two Points

- 1. AGDISP is widely available, user friendly and economical to run on a PC XT or Data General minicomputer
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Two Points

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Proposed Funding for AGDISP Enhancements

TASK

- 1. Deposition of non-volatiles
- 2. Add other atmospheric stability conditions
- 3. Enhance dry material option
- 4. Data verification of canopy and sampler deposition
- 5. Inputs for complex terraain interface
- 6. Toolkit for advanced users
- 7. Update new version at Missoula on Data General
- 8. Update AGDISP manual
- 9. Two training sessions
- 10 Add user friendly front end
- 11 Add automatic multiple drop runs
- 12 Incorporate suggestions from trainees
- 13 Add driver for HP plotter
- 14 Conduct sensitivity studies
- 15 Analyze Mission helicopter data

TOTALS

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